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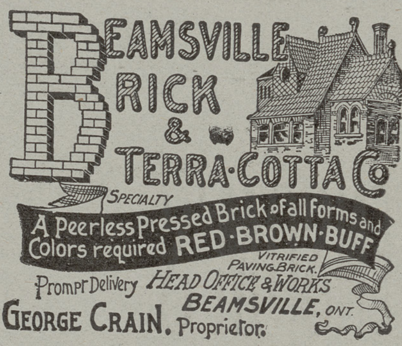

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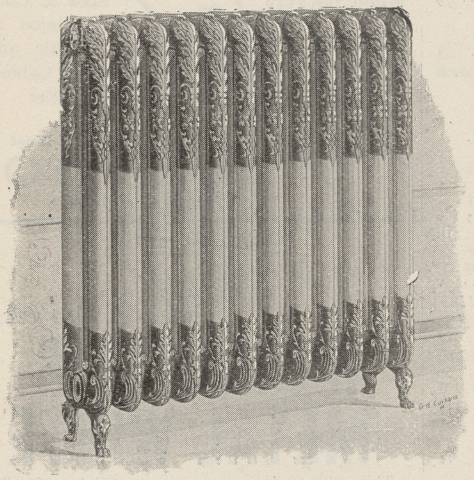

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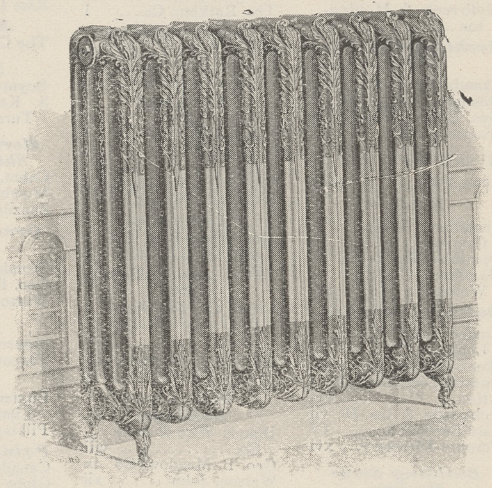

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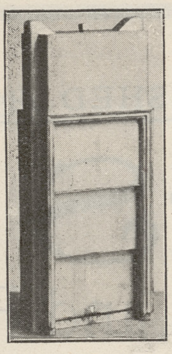

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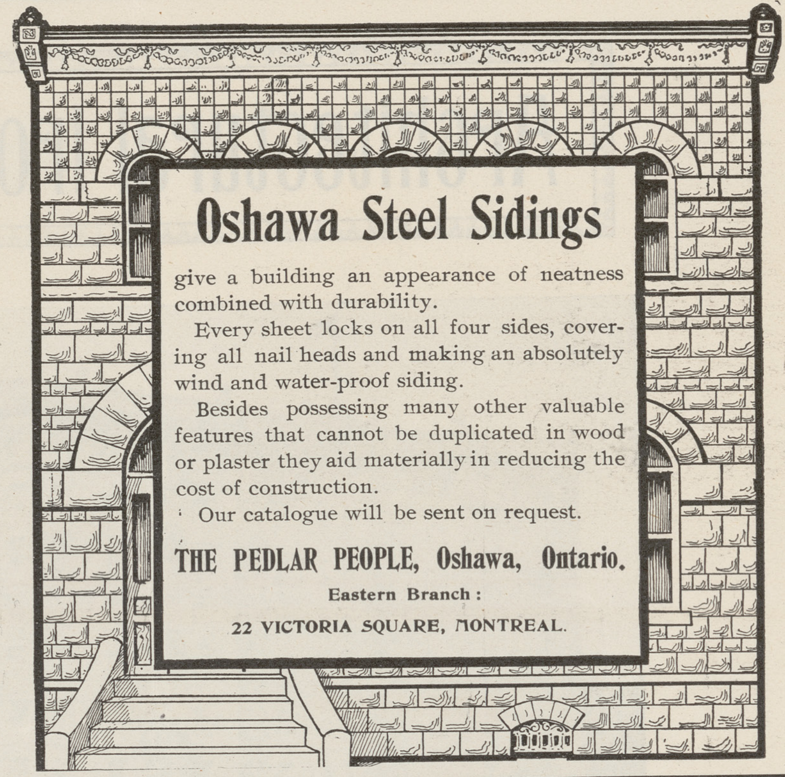

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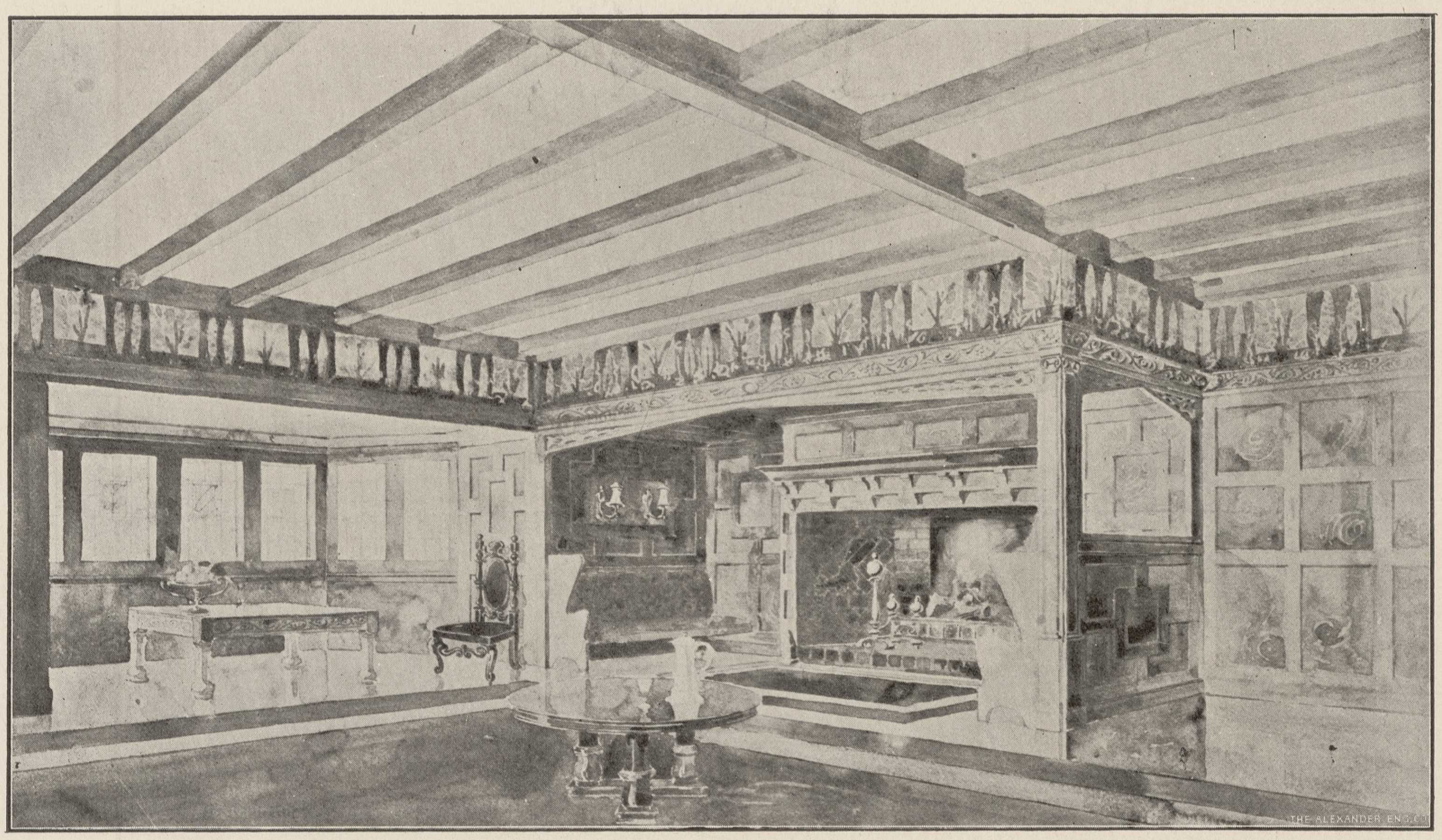

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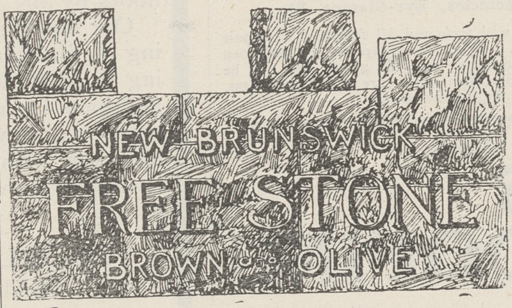

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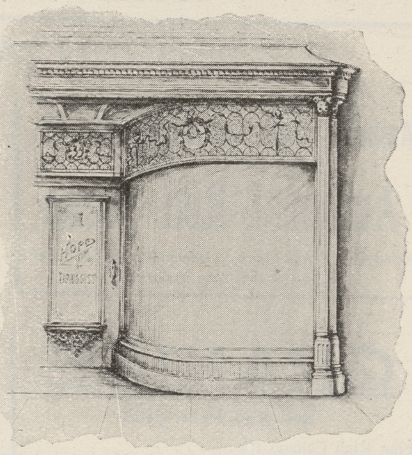

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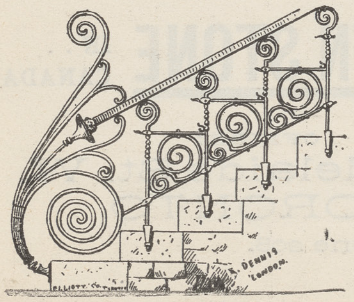

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The Canadian Architect and Builder

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ILLUSTRATIONS ON SHEETS.

House and Stable at Wenham, Mass.—Wm. G. Rantoul, architect.
Interior.—By G. S. Lemasnie.

ILLUSTRATIONS IN TEXT.

Portion of Chimney Hood.—Designed and Executed by the Elliott & Son Co., Toronto.
Cottage for Wm. Wadds, Esq., Rossland, B.C.—John T. Honeyman, architect.
Wesley Methodist Church, Vancouver, B.C.—Wm. Blackmore & Sons, architects.

ADDITIONAL ILLUSTRATIONS IN ARCHITECTS' EDITION.

Photogravure Plate.—St. Michael's Cathedral, Toronto.—W. T. Thomas, architect.
Residence of Lieut.-Col. Pellatt, Sherbourne St., Toronto.—Beaumont Jarvis, architect.
Designs for Furniture.—By G. S. Lemasnie.
Porta Delta Carta, Doges Palace, Venice.—By W. A. Delano, New York.

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SPECIAL CONTRIBUTORS.

PROF. S. H. CAPPER, R.C.A., Department of Architecture, McGill University, Montreal.
MR. W. A. LANGTON, Architect, Toronto.
" EDMUND BURKE, " "
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" FREDERICK G. TODD, Landscape Architect, Montreal.
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Fire Resisting Construction. The Royal Insurance Company, of Liverpool, has had printed and circulated a form of specification for rendering buildings less liable to destruction by fire. It provides that buildings shall not exceed 80 feet in height. Above the ground floor glass is to be ¼ inch thick in sections not larger that 2 square feet. In the case of wired glass sections are to be not less than 4 square feet. For external walls, brick terra cotta and concrete are to be used. Stone may be employed as facing when backed by not less than 13 inches of brick. On buildings constructed in accordance with this specification, the Company will make a reduction in their rates.

Spruce Lath. THERE is said to exist a slight prejudice against the use of spruce lath on the ground that sometimes they discolor the plaster. Recent inquiries from leading contractors in the Maritime Provinces would seem to disprove this contention. Messrs. B. Mooney & Sons, of St. John, write that they have never seen any stain or discoloration from spruce laths, and that, when clear of sap and wane, they give good satisfaction. In the eastern markets, including Boston, New York, and Philadelphia, spruce laths made from slab stock bring higher prices than any other. It is claimed that pine laths containing knots or balsam will discolor the plaster, whereas this drawback is not met with in the case of spruce. As the merits of spruce laths become more generally known a greater demand for them will develop.

The Decay of Stone Alarm has been caused the citizens of Glasgow by the discovery that the stone work and especlally the costly carving on the minicipal buildings is showing marks of rapid decay. The buildings were erected but a few years ago at a cost of about $2,500,000, stone from a newly opened Bannockburn quarry being used. As a test of the stone it was allowed to lie for a year in the builder's yard before being placed in the building. Although it stood this test satisfactorily, it began to decay in situ. The reason has not been discovered. Much older buildings in the same locality are in a good state of preservation. Instead of cutting out whole capitals of pilasters, as was at one time proposed, only the decayed portions are being cut away and a silicate solution applied for purposes of preservation. £600 has already been expended on this work.

Dangers of Steel Construction. General Sooysmith, head of one of the most prominent contracting firms in the United States, in a recent address before the Chicago Real Estate Association predicted

the early collapse of many of the tall buildings of that city in which imperfect steel construction has been employed. In the earlier buildings of this class, the steel framework instead of being imbedded in concrete, was simply cased with stone or brickwork, leaving crevices through which moisture might enter and corrode the metal. Under such conditions corrosion proceeds very rapidly, and the corrosion of one fifth of the substance of the metal of a supporting member at any given point, would in general, cause its failure. In view of General Sooysmith's warning it is urged that an immediate examination should be quietly made of buildings of the class to which he has referred, and measures taken to prevent an accident which would involve loss of life and so weaken public confidence in the stability of such structures as to seriously depreciate their value. Such an examination would also be likely to disclose facts of which architects should be possessed.

Reform in Architectural Competitions

By request of a number of prominent British architects, the Royal Institute will appoint a special committee to receive suggestions and formulate a plan whereby necessary reforms may be effected in the method of conducting competitions. In view of the unsatisfactory results of several important competitions held recently in England, the conclusion has been reached that in undertakings of a technical or complicated nature more than one referee is required. It is suggested that in such cases there should be two—one to be chosen because of undoubled ability as a designer the other for his special knowledge of the particular problem to be considered. In case these two should be unable to agree to an award it is proposed that they be empowered to elect a third architect as umpire. It is suggested that a list of architects in whom competitors have confidence be supplied to the president of the Institute, from which list a choice of referees could be made. It is urged that in cases where the promoter of a competition fails from any cause to carry out the undertaking it should be agreed that a substantial money payment should be made to the author of the selected design on about the same scale as if he has been commissioned direct to prepare plans without any competition.

Labor Conditions.

THE opening of the building season this year has been marked by more than the usual number of strikes embracing bricklayers, carpenters, painters, plumbers, and last of all the architectural structural ironworkers. Most of the disputes have been adjusted for the present season at least on a compromise basis, without much loss of time. The higher standard of wages which has been fixed in the various trades, has blocked quite a large percentage of building projects which would otherwise have gone forward this season. As an example a contractor who submitted tenders for four buildings states that only one of the four was proceeded with on account of the tenders being too high. The opinion prevails that the ever increasing demands of the unions for higher pay and shorter working hours, coupled with other restrictions almost too numerous to mention, will prove to be one of the most potent influences in bringing to an end the present period of prosperity. The broadening of the franchise has placed great political power in the hands of the labor leaders, which they have not been slow to exercise. As a result legislative bodies are pandering to them as never before, and are in danger of losing sight of the national welfare, which demands equal justice to all classes and the protection of capital as well as labor. It should not be forgotten that the interests of both are indentical and that any advantage given the one over the other can only be temporary. We should take warning by the experience of our sister colonies of Australia where the results of the labor laws are thus described in a letter by Mr. D. H. Ross, a Canadian, to Sir Richard Cartwright, Dominion Minister of Trade and Commerce: "The labor laws throughout the Commonwealth and New Zealand are of such character that the careful business man or capitalist seeking an investment would hesitate indefinitely before placing his business and capital under the sole control of the labor unions, which are so strong at the present time that they practically hold the balance of political power, and throw in their support with either party, Government or Opposition, which will agree to carry out their so-called labor reforms. A manufacturer's business is under their control to the extent that they dictate its policy, the number of employees permitted, the number of apprentices, their hours of labor, their rate of wages, their days of vacation, how the factory shall be lighted and ventilated, and so on, ad lib. Owing to these tyrannical labor laws, boot manufactures in Melbourne, who, previous to the federal tariff were protected to the extent of $1.20 per pair on men's boots, were scarcely able to make both ends meet. In Wellington, N.Z., it was recently stated that a large boot manufacturer there had decided to close his factory and become an importer, and boot operatives have recently arrived here from New Zealand looking for employment."

The Coronation Stone.

THE near approach of the coronation of King Edward the VII lends interest to the following particulars regarding the history of the famous coronation stone: That this stone was formerly in use in Ireland for the Coronation ceremony, that it found its way into Scotland—certainly earlier than the reign of King Kenneth, 834—that it was then removed to the Abbey of Scone, where for 450 years all the kings of Scotland were crowned upon it, and that it was brought to England by King Edward I. in 1296 after John Baliol, the Scottish King, had been defeated at Dunbar, are well ascertained historic events. There used to be a tradition that the stone was of meteoric origin, but Dean Stanley settled this matter when in his "Memorials of Westminster Abbey" he included a paper written by Professor Ramsay, called "A Geological Account of the Coronation Stone," in which it is said: "The stone is a dull reddish or purplish sandstone, strongly resembling that of the doorway of Dunstaffnage Castle, which was probably built of the stone of the neighbourhood. It is extremely improbable that it was derived from the rocks of the hill of Tara, from whence it is said to have been transported to Scotland, neither could it have been taken from the rocks of Iona. That it belonged originally to the rocks round Bethel is equally unlikely, while Egypt is not known to furnish any strata similar to the red sandstone of the Coronation Stone."

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A STUDY OF THE BASIS OF PROFESSIONAL ETIQUETTE.

Not long ago a speaker, at one of the English architectural meetings, spoke in a congratulatory way of the time being past when a leader of the profession (the allusion was evidently to Sir Gilbert Scott) would go about with a portfolio of churches under his arm, to call on building committees. On the other hand, we hear that in the United States, nobody dare wait for a job to come to him ; that Michael Angelo himself, if he lived in Chicago or New York, would have to hustle for work. Which of these two tendencies is in the direction of progress ?

What is all this hustling about ? What is there about hustling that should recommend it to clients ? The hustler is not hustling for his client's interest but for his own. A scholarly designer like Sir Gilbert Scott must have been a very high-class hustler. His kind of work implied personal attention to it. Yet there is a story of his going to a church opening, and, as he was being driven up to the church, turning pale and whispering to his confidential clerk, who was with him, "They have got the wrong church."

The typical hustler works *for* work not *at* it, and what the client wants is some one who will work *at* his work.

Of course the hustler works at his client's work in the sense of getting it through. He must have a good staff. That is partly what he is hustling about. It almost seems sometimes as if there is a point of view from which it is the staff which may be said to have a hustler, who spends his time upon the street to find work enough to pay them. Staff work, in fact, is the result of this system.

There is a certain medium class of commercial work for which staff work does well enough, and a certain class of client to whom it is a satisfaction to feel that his work is being handled in what he would call a business like manner; i. e. put through without fuss, in the shortest possible time, and looking when done like other new buildings of its kind. As a matter of fact the work is done in a business like manner. Let us give the style of practice all the credit that is due to it, in the best examples. The architect runs a plan factory. It has factory merits and factory defects. The merits are certainly a comfort to a client whose interest in his building is commercial; and the defects do not matter much from his point of view. But how about delivering over the whole field of architecture to this system ? It is bound to result in staff architecture, that is to say in factory architecture ; and factory architecture is not good enough for good work. Any body who knows what real planning is like will know that the case of Sir Gilbert Scott will be often repeated in a metaphorical sense. The right problem may be under consideration but the wrong plan will be produced. It is true that H. H. Richardson did not draw himself, but his mind was on design all the time ; he was devoted entirely to his work. It is true on the other hand that Mr. Ernest George (as he stated when receiving his R.I.B.A. gold medal) does nothing else but draw. He represents, that is to say, the possibility of a first-class man taking care of the design, while some one else gets the work and attends to the business connected with it. But Mr. George is as exceptional in his way as Richardson was. Under ordinary circumstances, if work has to be worked for, the big man of the concern will be devoted to that, as indeed he is now, and the architectural level must fall. That is bad for architecture, but what we are concerned with just now is that it is bad for the owner of architecture—the client. If this estimate of the consequences of hustling is sound, clients have no cause to smile upon the practice.

How about the architects themselves ? The profession professedly abhors the practice; and, at the end of the tariffs of fees, there is a clause defining professional etiquette in a way that practically excludes work hunting. But there commonly is a jocular way of speaking about the practice that implies uncertainty of purpose. At the bottom of this is uncertainty about the moral basis, a feeling that perhaps the new is the true and that old fashioned scruples are perhaps old fashioned for cause, like horsecars and the old, old systems of fifteen years ago. Morals however do not change. A gentleman is the same now as he was in

the days of "the grand old gardener and his wife", and as he will be when he walks the golden street of the new Jerusalem. It is this permanent quality of honour that attracts the regard of the architectural profession. The superficial points in professional etiquette may change; ideas of professional dignity may change; ideas of remuneration may change; the basis of these is not too deep for joking; but the matter of getting work is.

The truth seems to be that there is only one way of getting work that is right, and that is that an architect should always do his best work: put his best goods upon the market, that is to say, and let them speak for him.

It is a hard condition, for growth from small to large work may be slow. People who employ an architect for important work, like to see something that he has done of the same kind. "We judge ourselves by what we think we can do, but others judge us by what we have done," is a maxim which exactly fits the case of the young architect and states his difficulty. Competition (a question by itself) is accepted as a means of making a rapid step between small work and large. But, competitions or not, the step is sure to come in time to the really able, and usually before long; so that, though, like all other right conduct, some patience and faith and self-government are implied, the condition, though severe, is not more than a man should accept.

Why is this the condition of honourable practice? Because the moment a man reaches out for work he is reaching out for somebody else's work. If the work would not naturally come to him, it would naturally go to someone else. He reaches out for it; uses a "pull," asks, persuades, or merely works the magnetism of his personal presence—highly magnetized for the occasion—and the deed is done; he has knifed a neighbour.

This is the bottom fact that makes the profession uneasy about going about to get work. It is the disregard of others that is the dividing line between honourable and dishonourable practice. When another architect is already engaged, it is easy to recognize that he has rights and the better members of the profession are strict about not interfering there. It is a more uncertain state of affairs when work is in the air, and seems to be only waiting to be grasped. It is agony not to grasp it, but there is always a sense of shame before other members of the profession in doing so—and is not this the cause, that it has to be taken from some other member of the profession. If it is our's we may wait for it; if it is not our's whose is it? Somebody else's. Then for "taken from some other member of the profession", we may read, "stolen from some other member of the profession". It seems strange that men should think their duty to their wife and family obliges them to steal from some other man's wife and family. And this in a Christian land. Surely before we adopt the (reputed) American practice we should pause to think where we are going.

W. A. Langton.

The most magnificent work of architecture is the Taj Mahal, in Agra, Hindustan. It is octagonal in form, of pure white marble, inlaid with every sort of precious stone. The work took 22,000 men 20 years to complete, and though there were numerous gifts and the labour was free, the cost was £3,200,000.

BY THE WAY.

In view of the injury sustained by several persons by the recent fall of a balcony in London, the Builder suggests that District Surveyors should be instructed to examine balconies on streets through which processions will pass during the coronation ceremonies.

× × ×

I am interested to learn by what standard candidates for membership in the Ontario Society of artists are judged? A certain amateur artist was asked by the society to allow some of his works to be hung at the recent exhibition. His pictures attracted favorable notice and several of them were sold, yet I am told the artist was refused admission to membership in the society.

× × ×

The death of a man who recently fell over the stair railing in the City Hall, Toronto, has called attention to the proper height for such railings. The coroner's jury appointed to enquire into the cause of the accident returned a verdict of accidental death, but expressed the opinion that the railing was too low, and to insure safety should be made higher. On the contrary the architect of the building, Mr. E. J. Lennox, states that the railing corresponds to what has always been regarded as the standard height, namely 2 feet 6 inches. The matter is one which architects would do well to enquire into, lest some day they find themselves in the position of defendant in an action for damages.

× × ×

A young architect came to me the other day with a grievance which I am sure is shared by many citizens of Toronto. He had been out with his camera with the purpose of getting pictures of some of the best examples of domestie architecture in Rosedale, the annex, and other residential districts. In almost every instance he found a telephone or electric light pole, a real estate agent's sign or some such disfigurement so placed as to make it impossible to secure a satisfactory photograph. There is little encouragement given the citizens to build tastefully so long as unsightly poles and signs can be planted in front of their doors. It is time that the telephone company should follow the example of the electric light company which of late, in the best residential localities, has been steadily putting its wires underground.

× × ×

The property owners on Spadina Crescent, in one of the principal residential districts of Toronto, recently made the discovery that a livery stable was to be established in their midst. When they had set about getting up a petition to the Council, they learned that the limit of time allowed for filing a protest had expired. They are consequently without redress. This is but another instance of the hardship to which property owners are subjected because of the defective character of the city building by-laws. Owners of property should not be required to be constantly on the watch against encroachments upon their rights. The by-laws of the city should afford them protection. Under the existing by-laws, factories and other objectionable buildings can be erected anywhere, regardless of their effect on the beauty of the locality and the value of surrounding property.

INTERCOMMUNICATION.

[Communications sent to this department must be addres ed to the editor with the na e and address of the sender atta hed not ecessarily for pub ication. The editor does not hold himself responsible for the expressions or opinions of corre pondents, but will, nevertheless, endeavor to secure c rrect replies to queries sent in. We do not guarantee answers to all queries,neither do we undertake to answer questions in issue following their appearance.]

In the answer given regarding the proper laying of tiles in last month's number, there was a mistake made in placing the "cuts". The illustration given, numbered Fig. 1, should be Fig. 2, and Fig. 2, should read "Fig. 1", otherwise, the answer given is correct.

From "Carpenter":—Will you kindly inform me through your excellent columns, for what purpose the so-called diagonal scale on steel-squares, is used, and the method of using it?

Ans.—The diagonal scale which is found on steel-squares, and sometimes on pocket rules, is a very useful device for obtaining close measurements, and taking off quantities from plans that are drawn to a small scale and in obtaining the fractions of an inch. The use of this scale, however, does not seem to be as generally understood as the conveniences of it would warrant. The illustration, Fig. 1, shows a scale designed

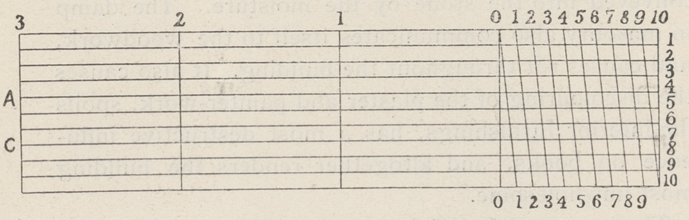

Fig. 1—Diagonal Scale.

for the purpose of measuring tenths and hundredths. This scale may be any length, but in this case, for convenience, we make it four inches long and one inch wide. We divide the width into ten equal parts as shown by the vertical figures, 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. Now divide one inch of the length of the scale, into ten equal parts also as shown. Now each one of these divisions represents one tenth of an inch, either vertically or horizontally. Draw diagonal lines from top to bottom as shown in the diagram, and these lines where they cross the horizontal lines, represent a difference of hundredths of an inch. Thus, for example, it is desired to take off, with the aid of compasses, any fraction of an inch, as, 24-one-hundredths, we proceed as follows:—run down the diagonal line marked 2, until we reach the horizontal line marked 4, which is the point required for one leg of the compasses, the other is placed on the vertical line 0, and the distance obtained is .24 of an inch. Again, if for example it is desired to lay off a distance of 3.67--three sixty-seven hundredths inches, we place one leg of the compasses on the point C, and the other at the intersection of the diagonal line 6 and the horizonal line 7. In the same manner any tenth or hundredth of an inch may be ascertained and transferred with the aid of a pair of compasses. The scale need not always be divided into tenths and hundredths, but may be divided into eights or any fraction that may be most convenient for the purpose desired. Primarily the use of the diagonal scale is to indicate minute measurements; and from it, it is not at all impossible to measure the 500th part of an inch, or indeed a smaller part; in actual practice, however, such minute measurements, are, as a rule, not required, but, in certain classes of drawing when a small scale is needed and extreme accuracy is necessary, the success of the operation will depend to a large extent upon the precision with which these small measurements are taken, and the diagonal scale is better adapted for insuring such precision than any other system.

From L.W.V.—Will you kindly publish an easy rule for finding the cubic contents of a stone wall or pier.

Ans.—A very simple method of arriving at the cubical contents of small portions of a building, as piers or footings, is the rule of cross multiplication, thus: what is the cubical contents of a pier or footing 4′ 2″ x 3′ 6″ x 2′ 0″? Rule,

4′ - 2″
x
3′ - 6″

12′ - 6″
2′ - 0″
1″

14′ - 7″
x 2′

29′ - 2″ Cubic feet.

Or this.—3′ x 4′ = 12 cubic feet.
" 3′ x 2″ = 0.6 " inches.
" 6″ x 4′ = 2′ 0 " feet.
" 2″ x 6″ = 12″ or 1 cubic inch.

14′ 7″ x 2′ = 29 ft. 2 cubic inches.

The rule to be observed, is that; feet multiplied by feet give feet, feet multiplied by inches give inches, feet multiplied by seconds give seconds, or 12M, inches multiplied by inches give seconds, or 12M. For the measuration of surfaces the same rule may be used, thus: what is the superficial contents of a surface, or wall 8′ 6″ x 8′ - 0″? Example:—

8′ - 6″
x
8′ - 0″

64′ - 0″
4′ - 0″

68′ - 0″ superficial feet.

From B. R. D.—Please inform me if there is any general rule giving the area or size of foundations for supporting given thickness of brick and stone walls, or for piers of any size, and if there are such rules, will you kindly publish same and oblige an old subscriber from the first?

Ans.—There is no specific or defined rules that can be relied upon as being accurate for the spread of foundations. Certain rules have been prescribed by those who have made a study of weights and pressures, but they have based their calculations on certain soils: for instance, a hard gravelly sand—if the strata does not rest on a layer of quicksand—may sustain a weight of 25 to 35 pounds to the square inch without compression, while a soil composed of an admixture of sand and loam will only sustain a weight of from 15 to 25 pounds to the square inch. Clay, however, is one of the most deceptive soils we know of for foundations; in dry weather it is capable of sustaining great weight, while in long damp seasons it becomes so permeated with moisture as to make it very compressible and dangerous. Experience is the best, and in fact, the only reliable teacher in the matter of foundations; and a very extended experience, too, is necessary to insure success

under all circumstances. If the soil is good—that is, solid and strong, with no under-lying strata of movable sands or soils, a safe rule for the width of footings for the wall is one and a half times the thickness of the walls of the building to be supported if such a building is not more than three or four stories high; so that if a wall is two feet thick, then the footings should not be less than three feet wide. If the soil is yielding or composed of sand and loam, or gravel and loam, or soil streaked with veins of clay and sandy clay, the width of the footings should be double the thickness of the wall. In some cases it should exceed these thicknesses, but in no case when the walls are over 40 ft. high, should the footings be less than from 2 to 4 times the width of the thickness of the wall. Isolated piers for columns or direct weights on small areas need more careful treatment and call for greater skill in deciding on area of base; and here no definite rule can be laid down only by proportioning the area of the base to the load to be carried and not exceeding a certain limit. The following rule, however, may be used to demonstrate the manner of arriving at the area of the base of a pier on medium good soil:

Height of pier, 20 feet.
Size of pier, 2x2 feet.
Material stone and mortar.

What is the safe area for the base, taking the average weight of stone and masonry at 200 pounds to the cubic foot? Rule.—2′x2′ = 4′x2′ 0″ = 80 cubic feet of stone-work. 80 cft. x 200 lbs. = 16,000 pounds. Assuming that 15 pounds to the square inch is a safe bearing, we divide 16,000 pounds by 15 and the answer is 1066.10 square inches equal to an area of

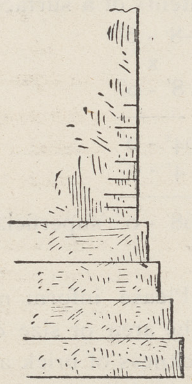

FIG. 1.—STEPPED FOOTINGS.

about 33x33 inches, or 2′-9″x2′-9″. In estimating the weight of a wall only one foot in length should be taken,—as for instance, a wall is 20 feet high by two feet thick, in every running foot of the wall we have 2 feet, which being multiplied by 20 equals 40 cubic feet, which, in turn, being multiplied by the weight per cubic foot (200 pounds) gives us the answer, 8,000 pounds—in every running foot of the wall. By using the same calculations as for piers, we find the weight, also the area required for footings. Footings, of course, must be brought to width of wall gradually, not by a sudden off-set but rather as shown at Fig. 2, where the width of foundation is reduced, step by step.

EBONY VARNISH STAIN.—This stain may easily be prepared by dissolving 1½ pounds of orange shellac and 4 ounces of resin in one gallon of methylated spirits, afterwards adding 2½ ounces of brilliant black analine (soluble in spirits). Stir well and pass through a fine strainer, when it is then ready for use. Apply quickly and evenly with a wide camel hair brush.

THE PREVENTION OF DAMP IN WALLS FROM EXTERNAL CAUSES.*

BY JAMES MCLEOD.

The question of excluding damp from walls is one of admitted importance: a dry house is a healthy house, a damp one nothing less than a dangerous dwelling, for damp is one of the most prolific and most generally acknowledged sources of disease. A damp wall checks the passage of air through its pores, is cold, and the evaporation from it lowers the interior temperature of the building, and consequently occasions a rapid radiation of heat from persons dwelling within its influence. This combination of damp and cold renders the building most unhealthy, and its inhabitants are liable to colds of every kind. Besides being so unhealthy, damp walls are uneconomical, by reason of the great absorption of heat by the evaporation of the moisture from their surface, and the consequent increased consumption of fuel required to keep the interior of the building warm. Dampness also causes an early decay in the materials used for the construction of the building. The decay of stone or brick is almost invariably the result of damp, either by its own action—by the freezing of the water in the walls—or by the acids which are conveyed into the stone by the moisture. The damp in masonry also communicates itself to the woodwork, and causes rot throughout the building. It also causes the discolouring of the plaster and painter-work, spoils the interior furnishings, has a most destructive influence on books, and altogether renders the building most unwholesome.

These matters are of no moment to the man who builds to sell and cares not how soon his work goes to pieces, but they are of the greatest importance to the occupier, who wishes a healthy home.

With the good building material which we have at our disposal in this district damp is an evil which we never reckon on in our work, and one which should give us little or no trouble, provided good material is put into the work and the workmanship is properly done. The materials in common use with us are stone, brick, timber and, occasionally, concrete.

Stone and brick are chiefly used, and these I shall deal with mostly; concrete is employed in places where those other materials are not easily obtainable, or for special purposes. Timber is only used for temporary structures, and need not be considered by us.

The treatment of stone and brick walls for the exclusion of damp is in most cases similar.

The walls of a new building are always damp. The quantity of water which is conveyed into a wall in the process of building is very great. Suppose, for instance, that 100,000 bricks are used in the construction of a wall, each weighing 7 lbs. Even a good brick can suck up from 10 to 20 per cent. of its weight in water, but let us assume 10 per cent. as what gets into it by the manipulations of the bricklayers; also assume that the same amount of water is contained in the mortar, a quantity much understated. The mortar forms one-fifth of the wall; thus nearly 100,000 lbs. of water, equal to about 10,000 gals., may be assumed to be put into the wall in the process of building.

The absorbing power of good sandstone is little less than that of brickwork; most limestones are very porous; Portland stone is said to be capable of absorbing

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*A paper read before the Glasgow and West of Scotland Technical College Architectural Craftsmen's Society on March 21st, 1902.

14 per cent. of its weight, and Bath stones as much as 17 per cent. This does not allow for the water in the plaster and other work, and can be taken as a fairly moderate estimate; and this moisture must be removed before the house is habitable. This is effected by firing the house, which should on no account be occupied till this is done, as the operation causes the air to become saturated with the moisture drawn from the wall; rendering it most unhealthy. A through draught of air greatly assists the drying of the interior of the building.

When walls have thus been freed from the initial damp it is their proper function to prevent water again entering from the outside, but as the external surface of the wall is always exposed to the elements, and as all building materials are more or less porous, the rain driven against the wall will penetrate into it. The water thus communicated to the wall is partly evaporated out again by the action of the sun and air and partly drawn through it by a capillary attraction, and if the material is very porous or the wall very thin this may saturate it. This is the chief cause of damp. It is not necessary, however, that it rain to convey damp to a wall. In the atmosphere itself there is always a certain amount of moisture, which varies with every degree of temperature; the amount increases as the temperature of the air rises. When the proportion of water in the air is greater than it can dissolve or hold, the atmosphere is said to be damp, but when the air can dissolve all the water it is called dry, notwithstanding that it still contains water.

During the heat of a warm day the atmosphere may be clear and apparently dry, although it really contains as much water as it is capable of dissolving at that temperature. Whenever the air is cooled, as for instance at night, it becomes unable to hold as much water as it did in the heat of the day, so that some of the water is discharged and becomes dew, mist, and even rain, according to the degrees and rapidity of the cooling process; and as all bricks, stone and similar materials are capable of absorbing this moisture from the air it is easily seen that it is possible for a wall built of very absorbent materials to be always damp, even in an atmosphere which seems to be dry.

One of the chief evils of this saturation of the wall is to cause decay in the material used.

Some of the water which has been deposited in the stone (or brick) is again drawn from it when the temperature rises. This causes a constant flow of moisture in and out of the stone, which gradually loosens the particles and allows the stone to crumble away. The action of frost, which tends to disintegrate the stone by the expansion in the freezing of the water enclosed in its pores, also causes the separation of the particles, and even in the absence of chemical action decay may result from that alone.

In addition, the water acts as a carrier of chemical agents, such as carbon-dioxide, carbonic, hydrochloric and sulphureous acids, all common in the atmosphere of towns; and these hasten the decay of the stone. Sandstone and bricks, being acid material, are not easily attacked by these gases; limestones on the other hand are easily corroded. Other things being equal, the more porous a stone the more easily it will be corroded. This combination of mechancial and chemical action often causes the decay to begin on the surface; this is not however always the case. It often happens that decay begins within the surface of the stone.

At a distance varying, according to its porosity, 1-32 in. to ½ in. from the surface of the stone there is a critical place beyond which the water does not usually pass, and where it always remains longest. It is here, not actually on the surface but behind it, that the decay generally begins. As it progresses it throws off a scale, which is often found to be in good condition on its outer surface, although the inner surface is rotten. A kind of sore of disintegrated particles is laid bare, which is more absorbent than the healthy stone, and assists and promotes the progress of decay, which, if not arrested, will proceed with greater rapidity than ever.

Although there are some exceptions, it may be laid down as a rule that the universal cause of decay in stone is damp or the evil influences associated with or conducted by damp.

I have here taken stone as an example. Bricks are also likely to decay in exactly the same manner, and an inferior brick will decay quickly under these circumstances.

The saturation of the wall with rain or moisture from the atmosphere is the chief cause of damp, but if the materials used are of good quality and are capable of throwing off the damp quickly, little or no harm will be done. If good materials are not be had, that which is at our disposal must be protected as much as possible; and it is some of the remedies for such cases that I have here noted.

Before passing on to them I might mention the damp which is occasioned by inferior workmanship. Carelessly fitted windows and window sills are a ready source; roughly-finished pointing may also let the water into the wall; but the chief evil is that of badly constructed plumber work, or the omission of a damp-course in a chimney head or in a parapet wall.

When sea water is used in the mixing of concrete for walls, it may cause an efflorescence, which is sometimes comparatively harmless, but which has a tendency to cause damp places in the structure that may lead to the destruction of plaster and paint, or perhaps to the detachment of fragments of the wall.

Time is the only real test of the various methods adopted, and as few records are kept of these it will be seen that when one is called upon to find a remedy it will be necessary to select one which is most likely to suit the particular needs of the case, and which is likely to have the most permanent effect.

If the material is known to be inferior before the wall is built of it, several methods which I will describe can be used with effect; but if the defect is only noticed after the building is completed the remedies which can be applied are mostly of a temporary nature and require frequent renewing. It is therefore best, if there is any doubt as to the material, that some method should be employed to ensure that the interior of the building is kept dry.

If possible the damp should be arrested on the surface of the wall, or it should be obstructed as near the surface as possible, so as to ensure that the greater portion of the wall is kept free from the damp.

One of the most effective methods employed for brickwork is that of building hollow walls. As you all know, the common way of building these is with the 4½ in. wall divided from the main wall by an air-space

of 2½ in. or 3 in., the two tied together by bonding bricks or metal ties. The 4½ in. portion of the wall is usually built on the outside of the main wall. The metal bonding ties are supplied in many different forms of cast and malleable iron and steel. A strip of steel, twisted in the centre to stop the passage of water and turned up a little at the ends to form a key in the joint, makes a good tie. All metal ties should be galvanized to prevent corrosion and consequent loss of strength, and the little cost involved is compensated by the lasting power of the tie.

It is a good plan to leave openings in the brickwork at the foot of such walls, so that at the finish of the work the bottom of the air space may be cleaned of the droppings and rubbish which may have accummulated during the building. These holes may afterwards be built up, or they may be covered with gratings to form ventilators.

The advantages of hollow walls are that they prevent the damp penetrating the wall further than the air-space, and if the thin portion is placed to the outside the damp is kept from the greater portion of the wall and at a greater distance from the interior of the building.

The air-space not only excludes the damp, but it acts as a non-conductor, which helps to keep the building warm.

The introduction of a vertical damp-course into the interior of the wall is another method which may be adopted. It consists of melted bitumen or asphalt run into the joints of the brickwork as the wall is being built, forming a continuous sheeting of water-proofing material in the interior of the wall. This makes a satisfactory job, and if properly done it will keep out the wet most effectively.

Of the various ways of waterproofing existing walls, Portland cement rendering is perhaps the most common with us. If this is carefully done, it is certainly successful, although the effect is not generally pleasing; 3 parts of good sharp sand to 1 of cement makes a good plaster, and care should be taken that the wall is rough enough to form a good key for it, or it may scale off after a time. It may be finished with a rough-cast or a smooth trowelled surface.

A building with impervious walls, although excluding damp from without, includes internal damp and allows no ventilation through its pores.

So much for the treatment of the walls themselves. I come now to the remedies (or rather the precautions which have to be observed) in the constructional work.

Projecting eaves are an advantage, and the more they project the more protection they offer to the surface of the wall. The objection of them is that they shade the wall from the drying influence of the sun's rays; thus damp which does get in is retained in the stone and causes rapid decay.

Cornices and all projections should be constructed to throw off the rain by means of throating and weathering, and everything should be done to keep the water off the face of the building.

All masonry, such as chimneys and parapet walls, should be provided with a suitable damp-proof course just at the roof level to prevent the rainwater from getting into the wall beneath. The rainwater gutters should have a sufficient fall to carry the water off quickly; they should be examined frequently and kept clean. The down pipes should be large enough to convey the maximum flow and prevent the frequent overflow of gutters.

In case of stoppage in gutters or down pipes overflows should be arranged, and these should be of sufficient length to throw the overflow water clear of the wall or projecting parts of it. Snow-guards should always be placed in gutters behind parapet walls and similar positions where the snow is likely to lodge and check the flow, and these should always be arranged to give a good run of water. These snow-guards should always be constructed of creosoted timber.

In conclusion, it must be evident that it always pays to use only the best material and workmanship in the building, as patching is always unreliable, and it is often found that it costs more to make good bad work than it would have cost had it been done right at first.

DRY ROT IN DWELLING HOUSES.

The first portion of a useful and interesting paper on this subject by Mr. Alfred Greenwood, M. D., D.P.H., and Mr. W. J. Ball, M. S. A., M. S. I., is published in the Public Health Engineer. Having had many opportunities of seeing houses affected by dry rot, the writers decided to investigate the subject with a view to determining the nature of its exciting and predisposing causes, and also the principles involved in its prevention and they offer the following notes as a preliminary contribution to further research. Dry rot may be described as an infectious disease of timber, which, under favourable conditions, through the agency of a fungus, occasions the destruction of the vegetable tissue in the walls and cells of the timber and finally reduces it to dry dust. The term should only be applied to those diseases of timber of fungoid origin which do not occur in the living tree. Wet rot is the term which should be applied to diseases not of fungoid origin, and which do occur in the living tree. Many observers have confused the terms dry rot and wet rot, and also have erroneously described as dry rot certain diseases of timber which have been caused by worms, etc.

Following are the conclusions drawn from the cases of dry rot which have come under the writers' notice : (1) The houses which were built at lower levels than those on the opposite side of the street were more liable to become affected by dry rot ; (1a) The diseased timber gives off a peculiar musty smell ; (2) The character of the materials employed in the walls and beneath the floors was of a porous nature ; (3) The clay foundation, being of an impervious nature, retained damp ; (4) Clay soil was in contact with the porous, local, hand-made bricks in the walls ; (5) The floor levels were slightly above the level of the adjoining street ; (6) There was no through current of air beneath the joists ; (7) The sleeper walls were solid, and not honeycombed or pierced ; (8) The distance between the underside of the joists and the surface of concrete was small ; (9) The joists were built into the walls without allowing for a free circulation of air around the ends ; (10) Linoleum was used to cover the surface of the floor in every case ; (11) The fungus showed the greatest development in each case between the fireplace and the inside kitchen wall ; (12) The "spores" were thickest in the cupboards, the mantels and other projections having thinner coats. These spores formed a reddish-brown powder, and when inoculated into

nutrient gelatine produced growths of Merulius Lachrymans.

It is necessary that in order to obtain good, sound timber, care should be taken that the conditions of growth, age, time of felling, character of timber, seasoning, shipping (as yellow fir timber is usually imported) and stacking are of the best. If the tree has grown in poor soils, and the aspects have been bad, the constitution will be affected. If felled too young, the wood is soft and tender, if too old, it is liable to decay. The best age for the felling of fir trees is from 70 to 100 years. If felled when the tree is full of new life, and the vegetative substances are in full action, it would afterwards quickly decay. The best time is, therefore, when the sap is at rest, viz., as a rule in the late autumn or winter. The "heart-wood" should always be used in preference to the newer or outer layers, as it is more durable. No sap wood should be used in the carpentry of timber floors. It should, therefore, never be used for building operations until it has been carefully stacked in a sheltered position with a free circulation of air around it, and signs of disease have been eradicated. If the timber has been obtained quite sound and well seasoned, it is then necessary to construct the floor in such a manner that it will always be kept perfectly dry, cool, well ventilated and free from contact with decaying vegetable gases. In order to do this successfully, the proposed adjoining street should be formed level across its width and effectually drained. If possible the site of the building should also be higher in level than the surrounding lands, and have a system of subsoil drainage below the level of intended foundations in the case of chalky, gravelly or sandy soils (care being taken to prevent the sand moving laterally). All vegetable mould should then be removed from the site, together with any old tree stumps or roots. The earth should be excavated to the depth of intended foundations and a layer of concrete of moderate thickness (not less than 5 in.) laid over the whole site. Broken brick and smithy ashes may be used as an aggregate for well-drained foundations, together with a Portland cement matrix; but it is better to use dense broken stone and clean gravel with plenty of Portland cement under the timber floors in the case of solid clay foundations as the water from the surface soils will be retained by the clay, and any increase in temperature will tend to force the damp vapour through the pores of the concrete.

When the earth is in contact with the surfaces of the walls immediately surrounding the floor they should be stuccoed with Portland cement or asphalte to the bottom of footings, or the brickwork should be built up from the surface of concrete to the damp course with Staffordshire blue brick in Portland cement mortar. Dry areas and hollow walls are also good when the thickness of the walls is not limited. The damp course should be placed two courses of brickwork above the adjoining finished street level, and may be of natural asphalte, Portland cement, slates in cement, stoneware, or other impervious material. The timber joists should then be laid above the damp course on a wrought iron bearing bar, about 2 in. wide by 3/8 in. deep, built into the wall (and not wood slips) in a cavity properly flushed round with asphalt or Portland cement so as to have 3/4 in. at least of free space on the other three sides between the timber and wall. The ends of joists should never be bedded in mortar, since quicklime has an injurious effect on timber if not dry. The air inlets should be on the same level as damp courses, and properly distributed so as not to miss the corners, the holes from these through the wall being floated round with Portland cement. The same precautions should be taken with sleeper walls as with external walls, and they should in addition be honeycombed to allow for a cross current of air, and earthenware pipes should be fixed under the other floors to another external wall if there is only one external wall to the room. This will not, however, always ensure a current of cool air, and it is better to carry an air flue alongside the ordinary smoke flues through the chimney shaft in addition. The thickness of joists should be a minimum, so that the underside area of floor boards could have a maximum amount of ventilation, as the floor boards generally rot worse where they are nailed and in contact with joists. The top of the floor boards, if washed, should be allowed to properly dry before placing linoleum on it. Carpet would allow for more ventilation, and in districts where dry rot is prevalent carpet is always preferable to linoleum.

NOTES.

There were 8,482,020 barrels of Portland cement manufactured in the United States in the year 1900; an increase of 2,829,754 barrels, or 50.1 per cent over the product of 1899.

"Did yez show Casey the conthractor, the Wash-nt-n moonyment?" asked Mr. Rafferty.

"Oi did," answered Mr. Dolan, "an' he wor deeply imprissed."

"What did he say?"

"He said it wor' the tallest one-story buildin' he iver saw!"

Paint made with red lead does not form a good protective covering for iron and steel for more than about six months under extreme conditions. Red lead is a better protection on the top of a beam than on the bottom, because in drying on the bottom its weight separates it from its base. A mixture of red lead, zinc oxide, and artificial barium sulphate is a much better paint than any of these materials used singly, and some experts advise the addition of carbon or lampblack. Such a mixture might readily possess qualities which are advantageous in a paint.

Drawing attention in a recent paper before the London Society of Architects to a few results obtained by colouring samples of cement with a small percentage of lampblack, red oxide and ultramarine, Mr. Humphreys remarked that it might at some time be found advantageous to incorporate colouring matter with cement. Should it, however, be decided to apply paint to cement work he believed that one of the best preliminary preparations was a solution of 1 part of good sulphuric acid in 100 parts of water freely applied to the surface of the work after the same had thoroughly set.

The English bricklayers who are restricted by the rules of their Union from doing more than a certain amount of work per day, have recently been shocked by the achievements of American workmen in connection with the construction of the Westinghouse Electric Company's large works at Manchester. These buildings, which the English workmen estimated would require five years to construct, have been put up in less than a year. The average bricks laid per man is said to have been 1,800 per day, as compared with 450 per nine hours, which is the trade union average.

Aluminum Nails.—After many unsuccessful experiments and trials, an alloy of aluminum has been made with which nails, staples and tacks can be made to compete with copper. Among other advantages claimed for the new material is, that it is not affected by the weather, and will not deteriorate, as in laying roofs, lining tanks, etc. As the alloy is non-corrosive and non-poisonous, the new nails ought to find favor among makers of refrigerators and other articles used for food storage. When the difference in point of number and weight is taken into consideration, it is seen that aluminum nails are about four cents a pound cheaper than copper nails. It is not intended to put them in competition with ordinary steel nails.—Hardware.

TESTS OF MASONRY PIERS.

The committee of prominent members of the Austrian Society of Engineers and Architects, appointed in 1897 to test the compressive resistance of masonry in large blocks and determine the strength of various floors, have presented their report, of which the following abstract is reprinted from the Engineering Record:

The famous tests on arches, made on an extensive scale by the Austrian Society, the report on which was published in 1895, have shown that the design and computation of masonry arches should be based on the theory of the elastic arch. But the second essential requirement of a correct design was still unfulfilled; namely, definite data as to the compressive resistance of masonry made up of stone and mortar. Only by the aid of these data are we enabled to determine the degree of safety a structure will have under given conditions. Owing to the scope of the tests under review and the great variety of materials employed in them the problem will be solved but very incompletely, but this investigation will certainly extend our knowledge in this direction and may become the incentive for further tests.

It was decided to test the following materials: Single granite and sandstone blocks; masonry blocks built of quarry-stones (sandstone), of ashlar masonry (granite and sandstone), of concrete, and of concrete reinforced by steel, of pier-bricks, ordinary bricks, and finally, of hollow bricks. Several proportions of mortar and of concrete were proposed for tests at different ages, and tests were to be made under central as well as under eccentric pressures. For each kind of masonry and each proportion of mortar two test prisms were proposed, and their dimensions were generally fixed at about 20 x 20 inches base and about 40 inches height. It was thought desirable to approach practice in preparing the test pieces in sets made with great care and sets made with less care, but the small number of tests and the practical difficulty of the proposition for comparatively small blocks did not favor it, and the tests were made on masonry supposed to be built carefully.

In Figures 1 to 5 are shown types of the different specimens:

1. Single block, Figure 1, and ashlar masonry, Figure 2, of hard sandstone and granite. Both horizontal sides were polished to planes parallel to each other. The joints were 3/4 inch and filled with mortar in the proportion of one volume of Portland cement to two of sand.

2. Broken stone masonry was made up of sandstone laid on its bed in mortar in proportions of 1 : 2 and 1 : 3 1-2. The specimens of type A were built in strong wooden boxes, all in one piece. Those of type B were built in two operations. First, three artificial blocks were made up of stones in smaller boxes, using the above mortar proportions. These blocks were then left to harden for a month's time. After that period the three blocks were laid to make up specimens of type B. The joints of this composite block were again filled with mortar of the proportion 1 : 2. The series of tests characteristic of type B was intended to show the behavior of artificial blocks as they have been prepared for long-span arches in the report on arches. In making up the specimen blocks the wooden boxes were first leveled up carefully on a layer of sand and set vertically, and the laying of stones was begun with a good mortar bed. The stones were set against the walls, and the top was leveled off with a layer of cement. Any open spaces between the masonry and the walls were filled with a grouting of mortar. To prevent the adhesion of the masonry to the wood the latter was covered with a layer of linseed oil before the laying of the stones began. For the blocks of ashlar, quarry-stone masonry and bricks, a slow setting Portland cement was used exclusively.

3. The concrete blocks were made of Danube sand, gravel and Portland cement in the proportions of 1 : 2 : 3, 1 : 3 : 5 and 1 : 4 : 6. As above, types A and B were made.

4. The concrete-steel blocks, Figures 4 and 5, were made of 1 : 3 1-2 concrete. The arrangement of the round iron rods is different in type A from that in type B, as can be seen in the figures. In type A the vertical main-rods have a diameter of 1/2 inch, and extend from plane of pressure to plane of pressure. They are connected by means of horizontal rings, 9/32 inch in diameter. In type B the main sets are laid parallel to the planes of pressure.

5. Brick masonry was made of common bricks as well as of pier and hollow bricks. It was laid in mortar of proportions 1 : 2 and 1 : 3 1-2. The same method of laying the bricks was used as for the stone masonry. The hollow bricks were laid with their holes vertical and filled with sand, except where unintentionally they were filled with mortar.

A hydraulic press capable of furnishing a slowly increasing pressure up to 1,320 tons was used for the tests.

Table 1 gives the detailed record of the tests. The tests of single stones of 1 foot square base show that the prevailing idea that granite must be considerably stronger than sandstone does not hold true in this case, as the limits within which the collapse took place were the same for both materials. The sandstone blocks showed, however, quite early the first signs of failure, while the granite completely failed and collapsed simultaneously with the first cracks, accompanied by an explosive sound and a breaking into small parts.

Table I, Details of Tests of Blocks, all loaded centrally except Nos. 5, 6 and 12 :

No.	Description	Proportion of mortar or concrete.	Age, mo's.	Pressures, lbs. per sq. in. 1st signs failure.	Break down.
	Single Stones, Fig. 1, 1 ft. square, 15¾ ins. high.				
1.	Granite Note A......	......	....	10,866	10,910
2.	Granite	......	....	8,130	8,550
3.	Hard sandstone......	......	....	5,460	10,380
4.	Hard sandstone......	.....	....	5,500	8,780
	Ashlar Masonry, Fig 2 :				
5.	Granite, Fig 11, shows loading............	1:2	5	......	8,110
6.	Granite, Fig. 11 shows loading...........	1:2	5	......	8,310
7.	Sandstone	1:2	5	Note B	......
	Quarrystone Masonry.				
8.	Hard sandstone in layers, Fig. 3a........	1:2	3½	2,760	3,220
9.	Ditto................	1:2	3½	2,810	3,870
10.	Ditto................	1:3½	3½	2,290	2,730
11.	Ditto................	1:3½	3½	2,360	2,820
12.	Hard artificial sandstone in layers, Fig. 3b......	1:2	6	.... .	3,540
13.	Ditto; Note C........	1:2	6	2,580	3,510
14.	Ditto; Note D........	1:3½	6	2,240	2,390
15.	Ditto................	1:3½	6	1,860	2,190
	Concrete.				
16.	Made in one block....	1:2:3	3½	1,690	1,780
17.	Ditto................	1:2:3	3½	1,450	1,850
18.	Ditto................	1:3:5	3½	......	839
19.	Ditto................	1:3:5	3½	655	977
20.	Ditto................	1:4:6	3½	......	655
21.	Ditto................	1:4:6	3½	......	668
22.	Made in three blocks..	1:2:3	6	1,350	1,780
23.	Ditto................	1:3:5	6	1,180	1,180
24.	Ditto................	1:4:6	6	796	868
	Concrete Steel Blocks				
25.	Made in one block, Note E............	1:3½	2	2,140	2,200
26.	Ditto................	1:3½	2	2,090	2,930
27.	Ditto................	1:3½	3½	2,420	3,780
28.	Ditto................	1:3½	3½	2,530	3,910
29.	Ditto................	1:3½	3½	1,980	3,800
30.	Ditto.....	1:3½	3½	2,110	4,220
31.	Ditto................	1:3½	6	1,860	3,360
32.	Ditto................	1:3½	6	1,990	3,340
33.	Ditto...	1:3½	6	2,890	4,180
34.	Made in three blocks.	1:3½	4½	1,640	1,850
35.	Ditto................	1:3½	4½	2,120	2,260
36.	Ditto................	1:3½	6	1,540	1,950
37.	Ditto................	1:3½	6	1,650	2,450
	Brick Masonry.				
38.	Paving brick	1:2	3½	2,520	3,770
39.	Ditto................	1:2	3½	2,840	3,820
40.	Ditto................	1:3½	3½	2,640	4,210
41.	Ditto.......	1:3½	3½	2,840	3,820
42.	Paving brick laid in 3 blocks	1:2	6	2,400	3,370
43.	Ditto................	1:2	6	2,380	2,660
44.	Hollow brick	1:2	3½	2,250	3,140
45.	Ditto................	1:2	3½	2,360	3,630
46.	Ditto................	1:3½	3½	1,910	2,290
47.	Ditto................	1:3½	3½	1,930	2,380
48.	Hollow bricks laid in 3 blocks	1:2	6	2,310	2,500
49.	Ditto................	1:2	6	1,920	2,450
50.	Pier brick laid in 3 blocks	1:2	6	1,360	2,280
51.	Ditto................	1:2	6	......	2,100
52.	Common brick	1:2	3½	555	1,450
53.	Ditto..	1:2	3½	1,010	1,850
54.	Ditto...	1:3½	3½	981	1,520
55.	Ditto..............	1:3½	3½	1,180	1,580
56.	Common brick laid in 3 blocks	1:2	6	1,540	1,850
57.	Ditto................	1:2	6	1,350	1,440

Note A.—Nos. 1, 2, 5, and 6 showed very coarse fractures.

Note B.—Test 7 could not be completed. At a pressure of 4,300 lbs per sq. in., no signs of failure were noticeable.

Note C.—In the case of Nos. 12 and 13, the upper block became separated during transportation and only the remaining prisms of the specimens were tested.

Note D.—The mortar for binding together the three artificial blocks into one prism was mixed 1:2 for Nos. 12 to 14 inclusive, 22 to 24, 34 to 37, 42 and 43, 48 to 51, 56 and 57. These joints were four months old in the case of Nos. 34 and 35, and 5 months in all other cases.

Note E.—Nos. 25 to 28 were cubes measuring about 16 inches on each side.

Laboratory tests made by Building Councillor Hanisch on some sandstone cubes of the same quarry, 2.4 inches on each side, gave an average breaking resistance of 10,900 pounds per square inch, while analogous tests made on granite gave completely different results. The latter tests gave the average breaking resistance of granite as 19,400 pounds per square inch. But it must be stated that the granite used in the laboratory tests was very fine grained. The specific weight of the sandstone was found to be 2.55 and that of the granite 2.57.

The ashlar masonry of granite was tested under an eccentric pressure. These tests of No. 5 and 6, as well as the analogous test of quarry-stone piers, No. 12, proved to be of great interest.

joints could not be crushed. Owing to some accidents the test piers of sandstone masonry No. 7 could not furnish data for the ultimate strength of the same. But referring to the uniform behavior of Nos. 1 to 4 it may be assumed that the ultimate strength of sandstone masonry is about the same as of granite masonry, Nos. 5 and 6.

The behavior of quarry-stone masonry is characterized by tests of piers Nos. 8 to 15. They show a certain uniformity, inasmuch as the piers having mortar in the proportion of 1 : 2 gave better results than those with mortar of 1:3½. The higher age of the mortar in Nos. 12 to 15 proved to be of no influence, counteracted as it was by worse workmanship; No. 15 especially showed, after failure, poor stone laying.

Cracks appeared in the stones independently of the joints, Figure 8, and increased in number with increasing pressure, and finally failure took place independently of the joints. As shown in Figure 9, upper and lower wedged-shaped pieces remained standing after failure. These wedges were completely destroyed in themselves. It follows from this behavior of the quarry-stone masonry at the first appearance of cracks, as well as at final failure, that the masonry may be considered in the above cases as a homogeneous body of uniform elasticity and breaking resistance. Similar behavior was also shown by the brick masonry.

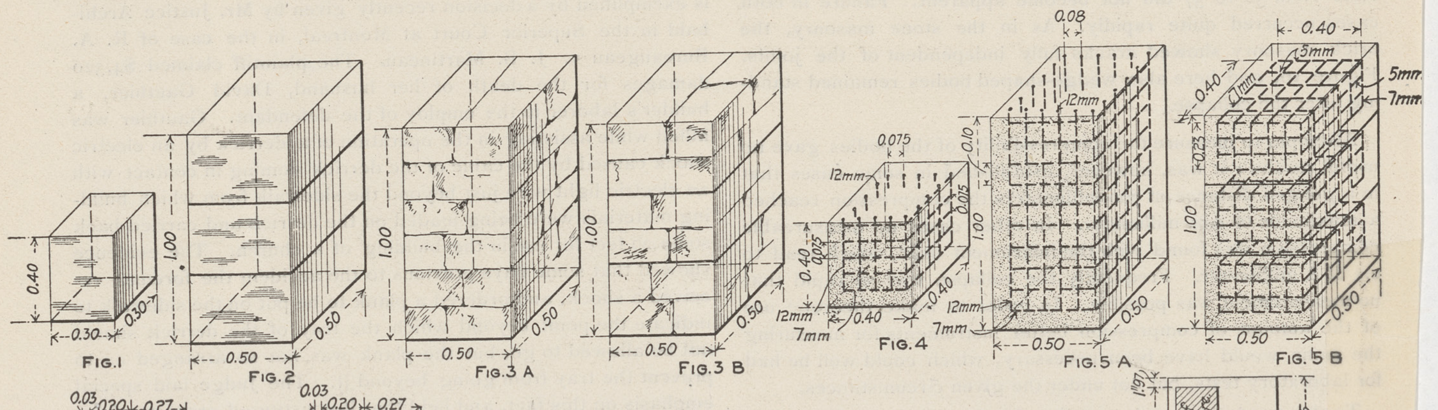


Diagram Illustrating the Austrian Report on Tests of Pier Masonry.

(Dimensions are in meters except in case of Figures 11 and 12.)

It is commonly assumed that according to the distribution of pressures the body fails either through the crushing of the edges or the opening of the joints, somewhat in the manner indicated in Figure 6. This did not take place at all. Failure occurred more in the manner characterized by Figure 7, and the opening of joints took place only in case of No. 6. No. 12 did not show even a flaking off of the mortar finish.

It hence follows that the failure of the masonry took place by a simultaneous shearing and crushing of the shaded area, and that in order to determine the breaking resistance the area on which the pressure was exerted directly must be taken in account. The results obtained in this way are very satisfactory; the tests, No. 12 especially, well agree with values determined for central pressures. The behavior of masonry under eccentric pressure shows that while at small pressures the common theory of distribution of pressures in the joints and the values deduced from it for the computation of arches seems to be correct, the conditions are totally changed at the time of failure, and that the eccentric pressure is then uniformly distributed over the immediate area of contact. The remaining portion of the masonry exerts then no longer any influence, as otherwise the joints would undoubtedly have opened in all the cases tested, and failure of the mortar by tension would have taken place. Interesting as these tests under eccentric pressure proved to be, they were later dropped, because the determination of ultimate strength from central pressures furnishes more reliable data.

In all cases it was proved that the thin layer of mortar in the

The elasticity and the breaking resistance are, of course, dependent on the materials the stone and mortar, but in no case is the strength of the masonry exclusively determined by the strength of one or the other of its constituents only.

The test piers of concrete, Nos. 16 to 24, gave uniform and quite unfavorable results. Failure took place rapidly and almost simultaneously with the first indications, and the tests of the poorer proportions of the concrete showed an almost complete disintegration of the body. The more favorable results of Nos. 23 and 24 are due to the higher age of the concrete.

The great influence of iron netting imbedded in concrete is shown by the test of the Monier piers, Nos. 25 to 27. The piers of type A, with vertical rods extending from plane of pressure to plane of pressure proved to have a very great resistance, and it was not possible to attain the complete failure of the same. In all cases the vertical rods yielded first, then the external covering material gave way, and only then the failure of the inner portion could begin. The latter showed wide vertical cracks, but complete failure was never observed, owing to the excellent quality of the concrete used. It should be noticed that the horizontal rings which surrounded the vertical rods were held together at their ends only by thin wire. With the use of thicker horizontal rings and the welding together of their ends the yielding of the vertical rods, and with them the failure of the whole body, will be pushed much higher up. The shorter age of the cubes, Nos. 25 and 26, appears in the less favorable results. The tests on prisms of type B, Nos. 34 to 37, were, notwithstanding

their greater age, less satisfactory than those on type A

The tests on piers of paving bricks, Nos. 38 to 43, gave the highest resistance of all brick piers ; the low result obtained with No. 43 is evidently due to the poor workmanship of this specimen. The behavior of the paving bricks was interesting, inasmuch as very fine cracks became visible even under low pressure, which is probably due to the rigidity of the material and to an incomplete uniformity of distribution of pressure. The figures in the table correspond to somewhat wider cracks, which would indicate the beginning of failure. The behavior of the piers of hollow bricks, Nos. 44 to 49, made a favorable impression ; they showed great uniformity. The proportion of the mortar used proved here, as in the case of the quarry-stone masonry, to have an influence on the results, and, the same as in the case cited, the piers composed of the three blocks, Nos. 48 and 49, gave correspondingly less favorable results. But it must be remarked that the hollow spaces of the individual bricks were completely filled with mortar, so that the whole body formed one solid mass.

The tests of pier-bricks and common bricks closed the series of tests of brick masonry, their strength being lower than the above-mentioned varieties. Each series of the former showed corresponding uniformity, though the difference in mortar proportion in tests Nos. 52 to 57 did not become apparent. Failure in both cases occurred quite rapidly. As in the stone masonry, the brick masonry showed cracks fully independent of the joints, Figure 10, and here also wedge-shaped bodies remained standing after the collapse.

Attempts to measure the compressibility of the bodies gave no useful results ; it was, however, established in some cases that in a guaged distance of 700 millimeters the compression reached a maximum of one millimeter. In other cases no measureable compression was found with the instrument used, which read to 0.1 of a millimeter. Frequently the collapse was so rapid that no measurement was possible. In order to make theoretic use of the amount of compression better instruments for measuring the same would have been necessary, which could well be had for laboratory tests, but not under the given circumstances.

To the conclusions and remarks already made above the following may be added : With few exceptions the tests have proved the great strength of masonry, compared to which the usual allowable working stresses appear to be very small. The influence of age did not prove, after the expiration of a given time, as important as it is generally held to be ; on the other hand the proportion of the mixture of the mortar used showed its influence on a whole series of tests. The tests of piers composed of artificial blocks type B, give, as a rule, worse results than the similar results of piers of type A, made in one piece. This was due to the fact that the smaller artificial units were weakened by the manipulations of their laying after a hardening of four weeks. With materials of equally good quality the value and strength of our structures is in first time dependent on their workmanship during construction.

The usual tests of stone and mortar separately cannot be regarded as satisfactory and sufficient to base on them a reliable conclusion as to the strength of the mass composed of them. It is best in all cases of considerable structures to undertake the tests on masonry blocks of as great dimensions as possible.

Table II give the average compressive strength at the instant of failure of the various kinds of masonry tested. They have been deduced from the above results for Portland cement mortar three to four months old. It should be remarked that the compressive resistance alone is not decisive for the excellence and suitability of the different types of construction.

Table II.—Average Compressive Stress in Pounds per Square Inch, at Failure.

Kind of masonry.	Mortar or concrete.	Resistance.
1. Ashlar masonry of granite	1:2	8,110
2. Quarrystone masonry of hard sandstone in layers.	1:2	3,550
3.	1:3½	2,560
4. Gravel concrete.	1:2:3	1,780
5.	1:3:5	925
6.	1:4:6	711
7. Concrete steel in one block, Type A	1:3½	3,840
8. Masonry of paving bricks	1:2	3,550
9. Same of hollow bricks	1:2	2,845
10. Same of pier bricks	1:2	2,130
11. Same of common bricks	1:2	1,640

No. 1—The test of sandstone ashlar masonry was omitted as being incomplete, but according to the above it may be taken the same as for No. 1.

No. 7.—The Monier piers of type B give, as follows from the previous table, much less favorable results.

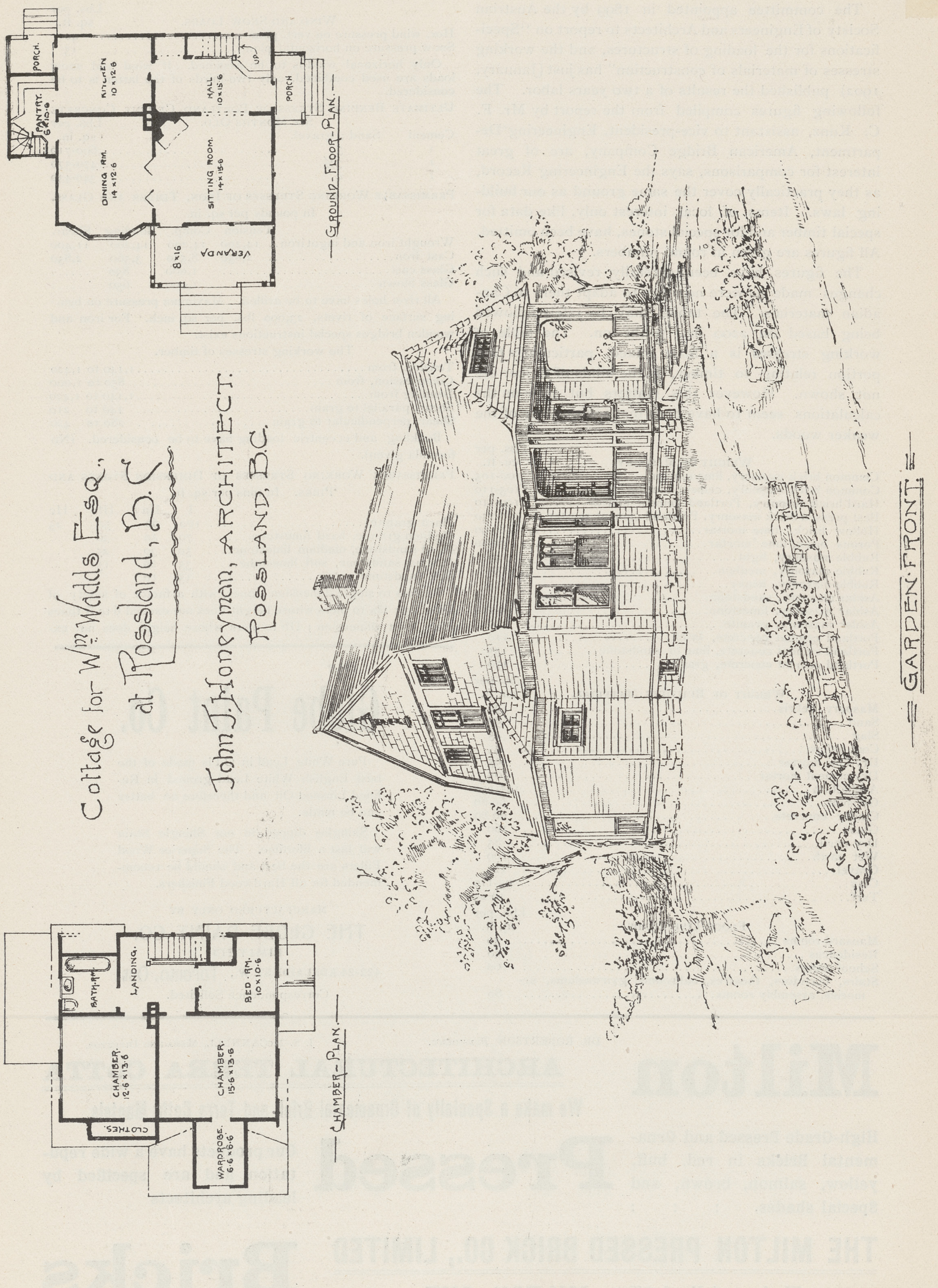
Nos. 8 to 11 inclusive.—For the brick masonry only mortar of the proportion of 1:2 was considered after it was found that the poorer mixture of 1:3½ did not show its influence in the series of tests.

Interesting as the above tests proved to be, it became evident that the narrow limits within which they were undertaken are not sufficient to establish clearly the behavior of masonry under stress. Researches more extensive in time and in scope are required for this purpose, and only a scientific institute established for such purposes can afford an opportunity to accomplish them. No doubt the great saving which would be effected by a thorough knowledge of the materials of our structures would well repay the necessary expenses. The above tests are only a step forward ; they are mainly intended to induce further research in this direction.

LEGAL

The necessity that contractors and their foremen should exercise the greatest possible care to prevent accidents and liability to themselves by reason of injury to workmen in their employ, is exemplified by a decision recently given by Mr. Justice Archibald in the Superior Court at Montreal, in the case of R. A. Bureaugeau v. J. B. Martineau. The plaintiff claimed $4,320 damages for the death of her husband, David Gauthier, a builder's laborer in the employ of the defendant. Gauthier was killed while assisting in the operation of a derrick by an electric shock caused by the cable of the derrick coming in contact with an electric light wire just beyond the sidewalk from which building materials were being loaded on the derrick and carried back some 20 feet for use in the building of a church. The evidence showed that some days previous to the accident the foreman received a shock, and ordered a plank to be put on the sidewalk to indicate the point beyond which the tray of the derrick should not be allowed to go, but the plank was not so arranged as to prevent the tray from going beyond it. The Judge laid special emphasis on this fact, and held that it constituted gross careiessness on the part of the foreman. For the defence it was contended that Gauthier had received no orders to assist with the derrick on the morning of the accident, but did so of his own accord while waiting for instructions. The Judge ruled out this plea on the ground that the man had been assisting with the derrick on the previous day and had received no instructions that he was not to resume his former duties. Judgment was given in favor of the plaintiff for the sum of $2,500, half for the benefit of the wife and half for a minor child.

PIMPERTON v. MCKENZIE.—Judgment (R.) on motion by plaintiff to set aside judgment of Falconbridge, C. J., and for a new trial in action by administratrix of estate and mother of Maurice Pimperton, deceased, for damages. The defendant is lessee of a wharf adjoining the basin of the Rideau Canal, in the Town of Smith's Falls, and uses a derrick erected for the purpose of unloading boats filled with coal to be used by defendant in his business as a coal merchant. On May 15, 1901, deceased came upon the wharf to help unload sand from a barge, whose captain had paid $5 for the use of the wharf, when, owing, as alleged, to the negligent staying and management of the derrick by the defendant, who assumed it as a volunteer, the derrick overbalanced and fell upon the plaintiff's son and instantly killed him. The derrick was sustained by guy ropes, and defendant, it is alleged, did not fasten one securely which was untied to enable the boom to be turned to the south. The Chief Justice withdrew the case from the jury at the close of the evidence on behalf of plaintiff, on the ground that where one person charges negligence against another the basis of the action must lie in some duty which was due by the defendant to the plaintiff ; that in this case defendant had nothing to do with the unloading of the vessel, the sand was not for him, and he had not assumed any duty, but was acting as a mere volunteer. Held, that the evidence failed to show that the defendant was in charge of and directing the work while the derrick was being placed in position, and that the derrick and boom were improperly constructed and not well fitted for their intended work. Held, also, that the evidence did not show that defendant had undertaken the duty of making fast what is called the fourth guy rope, and had failed to perform his duty, and that this was the cause of the accident. Motion dismissed with costs.



Cottage for Wm. Wadds Esq., at Rossland, B.C.

John J. Honeyman, ARCHITECT, ROSSLAND, B.C.

LOADS AND WORKING STRESSES FOR BUILDING WORK.

The committee appointed in 1899 by the Austrian Society of Engineers and Architects to report on "Specifications for the loading of structures, and the working stresses of materials of construction" has just (January, 1902) published the results of a two years labor. The following figures compiled from the report by Mr. F. C. Kunz, assistant to vice-president, Engineering Department, American Bridge Company, are of great interest for comparisons, says the Engineering Record, as they practically cover the same ground as our building laws. Items of local interest only, like data for special timber and for special stones, have been omitted. All figures are given in round numbers.

The figures have been carefully revised and such changes made as were necessry to adapt them to Canadian materials. The tables may be safely followed being based on 2200 lbs. to the ton. The table of working stresses is a little mixed, particularly that portion relating to timber, as the kinds of timber are not shown. However this matters but little as the calculations seem to have been made with some of the weaker woods.

Weight of Masonry.	Lbs. per cu. ft.
Common brick masonry, lime mortar	100-105
Common brick masonry, cement mortar	105-110
Hard brick masonry, Portland cement mortar	100-110
Best pressed brick masonry, Portland cement mortar	120-130
Hollow brick, lime mortar	80-90
Porous brick, lime mortar	70-80
Rubble masonry, light	140
Rubble masonry, medium	150
Rubble masonry, heavy	175
Ashlar masonry, sandstone	130-155
Ashlar masonry, limestone	125-160
Ashlar masonry, granite	200
Portland cement concrete, brick	110
Portland cement concrete, lime or sandstone	135
Portland cement concrete, granite	170

Weight of Building Material.	Lbs. per cu. ft.
Masonry debris	90
Sand	90
Slag	45
Coal ashes	45
Dry lime mortar	95
Dry cement mortar	105
Asphaltum	125-130
Gypsum	60-80
Cinder concrete	60-80
Glass	160
Dry earth	85
Wet earth	100
Gravel	125
Clay	95-110
Turf	10-25

Floor Live Loads.	Lbs. per sq. ft.
Mansard rooms	30
Residences	50
School rooms	60
Stairs, corridors, theatres, ballrooms, gymnasiums, armories, assembly rooms	80
Offices, light storage, above first floor	90
Offices, light storage, first floor	115
Ice storage (ice 3 ft. hight)	155

Wind and Snow Loads.	Lbs. per sq. ft.
Hor. wind pressure on vert. plane	40
Snow pressure on horizontal plane	15

Only horizonal wind is to be assumed. If wind and snow loads are used combined, only two-thirds of the latter is to be considered.

Ultimate Bending Stress of Portland Cement Concrete Six Months Old.

Cement	Sand ; gravel.	Lbs. per sq. in.
1	3	600-710
1	3½	470-570
1	4	340-430

Permissable Working Stresses of Iron, Timber and Glass.

In pounds per sq. in.

	Tension	Comp.	Bending	Shear.
Wrought iron and ingot iron	14,200	14,200	14,200	11,400
Cast iron	2,850	8,530	3,560	2,850
Glass cast		1,000	850	......
Glass blown		1,000	650	......

All rivet holes have to be drilled. Maximum pressure on bearing surface of rivets, 23,000 lbs. per sq. inch. For iron and wooden bridges special instructions exist.

The working stresses of timber.

Tension, from	1,140 to 1,420
Compression, from	850 to 1,000
Bending from	1,140 to 1,420
Shear, parallel to grain	140 to 210
Shear, perpendicular to grain	280 to 420

Buckling and eccentric loading have to be considered. (No formula given).

Permissable Working Stresses of Dimension Stones and Piers. In tons per sq. ft.

	I	IIa	IIb	IIc
Hard granite	100	60	50	25
Medium granite, hard limestone	70	40	30	..
Hard sandstone, medium limestone	50	30	25	..
Medium sandstone, soft limestone	35	20	15	..
Soft sandstone	15	10		

I refers to single dimension stones, with a factor of safety of about 15 ; IIa to piers whose height does not exceed 6 to 8 times their least dimension ; IIb to piers whose height does not ex-

ceed 8 to 12 times their least dimension ; and IIc to piers whose height does not exceed 12 times their least dimension. For all stones except granite, which are kept continually wet, these figures do not apply.

PERMISSABLE WORKING STRESSES FOR OTHER MASONRY.
In tons per sq. ft.

	a	b	c
Common brick, lime mortar	5	7.5	10
Common brick, Roman cem. mortar	7.5	5	..
Common brick, Port. cem. mortar	10	7.5	5
Rubble, lime mortar	4	..	..
Rubble, Roman cem. mortar	5	..	..
Rubble, Port. cem. mortar	8	..	.
Coursed rubble, Port. cem. mortar	10	..	..
Hard brick, Port. cem. mortar	12	8	6
Best pressed brick, Port. cem. mortar	20	15	10
Concrete for foundations :			
Roman cement 1, sand and gravel 5	5	..	..
Concrete for walls :			
Portland cement 1, sand and gravel 3	18	..	..
" " 1, sand and gravel 5	12	..	..
" " 1, sand and gravel 8	8	..	..
" " 1, sand and gravel 10	6	..	..

In these groups a refers to walls not under 18 inches thick and piers whose height does not exceed 6 times their least dimension; b to walls under 18 inches thick and piers whose height does not exceed 6 to 8 times their least dimension ; and c to piers of at least 12 inches smallest dimension, whose height does not exceed 8 to 12 times their least dimension.

PERMISSABLE WORKING STRESS IN MASONRY ARCHES UP TO 30-FOOT SPANS. In tons per sq. ft.

	Compr.	Tension
Common brick, lime mortar	6¾	0
Common brick, Roman cem. mortar	70	0
Common brick, Port. cem. mortar	10	1
Hard brick, Port. cem. mortar	12	1
Best pressed brick, Port. cem. mortar	20	0
Concrete, Port. cem. 1, sand and gravel 3	18	3
Concrete, Port. cem. 1, sand and gravel 5	12	2
Concrete with iron (Melan, Monier, etc., systems), Port. cem. 1, sand and gravel 3	21	8
Dimension stones, (except soft sandstone) in Portland cement mortar	25	1

The figures are based on a mortar of 1:3.

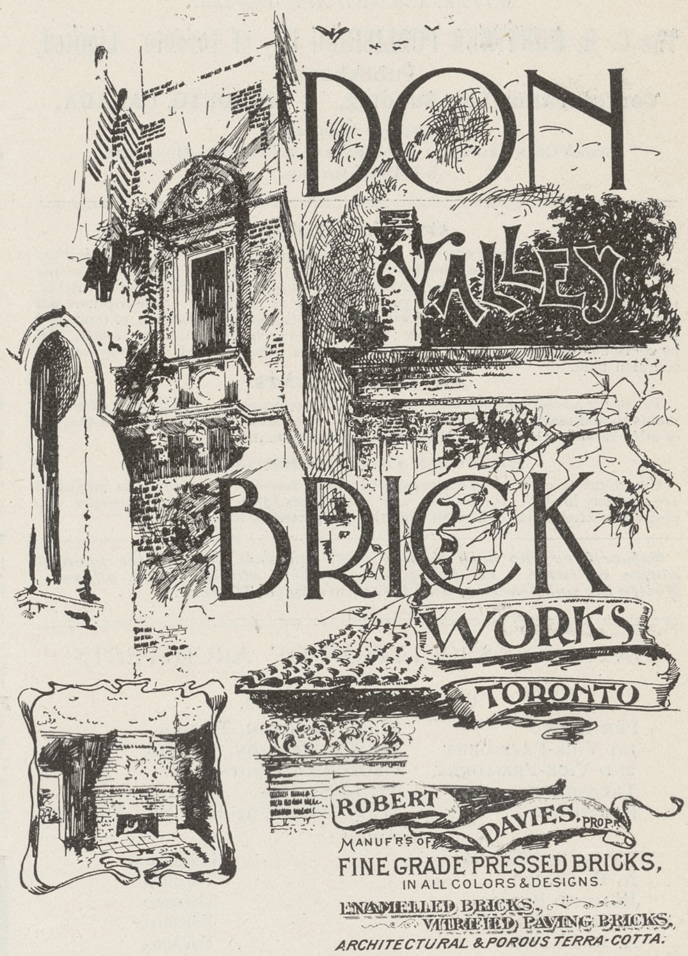
Permissable working stress for stone stairs can be taken as one-fifth of the ultimate stress for bending.

PERMISSABLE PRESSURE ON FOUNDATIONS.
In tons per sq. ft.

Soft clay and wet sand	1.0
Ordinary clay and dry sand mixed with clay	2.0
Loam, hard clay and sand without clay	4.0
Firm coarse sand and gravel	6.0

Piles in loose, wet soil should not be stressed more than 350 lbs. per sq. in. of their cross-section. They should be placed not more than 3 ft. apart.

Mr. W. E. Doran, architect, was recently appointed to the Montreal Board of Harbor Commissioners.



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Contributions of value to the persons in whose interest this journal is published are cordially invited. Subscribers are also requested to forward newspaper clippings or written items of interest from their respective localities.

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Specifications for Painting Iron and Steel.—The following are extracts from regulations drawn up in the painting specifications by one of the principal continental railway companies for the painting of iron and steel work:—"All ironwork must be thoroughly cleansed by scouring with wire brushes and benzolene or by steeping in dilute hydrochloric acid, the acid to be afterwards neutralized with lime water and finally rinsed with hot water and dried. The ironwork is then given a coat of pure linseed oil which has been heated to 100 degs. Fahr., which must be allowed to thoroughly dry. The work is then given two coats of genuine red and one coat of white lead mixed in boiled linseed oil, to which has been added from two or three per cent. of litharge or lead acetate. Each coat of paint must be allowed to dry before applying the next and in favourable weather. When three or more coats are applied, each coat of paint should differ somewhat in colour, in order to determine the number of coats applied.

NOTES.

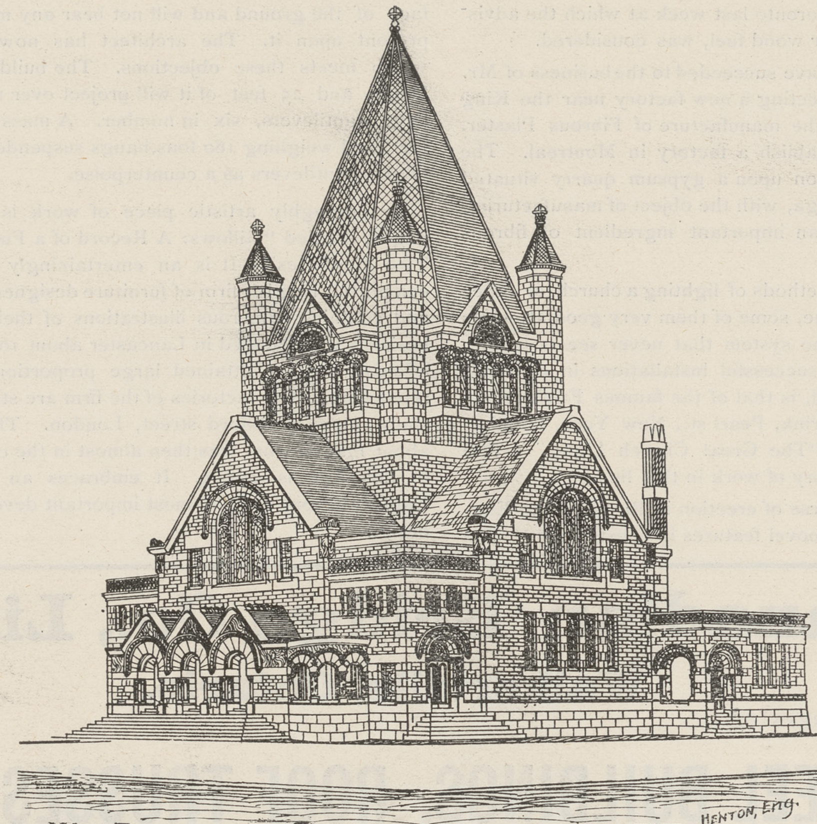
A meeting of the representatives of the local lime manufacturing companies was held in Toronto last week at which the advisability of substituting coal for wood fuel, was considered.

The imperial Plaster Co. have succeeded to the business of Mr. W. A. Bradshaw, and are erecting a new factory near the King street subway, Toronto, for the manufacture of Fibrous Plaster. It is the intention to also establish a factory in Montreal. The Company have taken an option upon a gypsum quarry situated between Dunnville and Cayuga, with the object of manufacturing plaster of Paris, which is an important ingredient of fibrous plaster.

There are a great many methods of lighting a church or other large auditorium now in vogue, some of them very good attempts at successful lighting, but the system that never seems to fail, and has scored over 20,000 successful installations in churches alone in all parts of the world, is that of the famous Frink reflector, manufactured by I. P. Frink, Pearl st., New York, familiarly known to thousands as "The Great Church Light," a title gained by nearly half a century of work in this line.

A building is now in course of erection in Birmingham, England, that represents some novel features in construction. The plot has remained unoccupied for many years because the tunnel of the Great Western Railway runs three feet beneath the surface of the ground and will not bear any more weight than is at present upon it. The architect has now planned a building which meets these objections. The building is three stories in height and 25 feet of it will project over the tunnel, carried on huge cantilevers, six in number. A mass of concrete, 16 by 15 feet, and weighing 160 tons, hangs suspended from the other end of the cantilevers as a counterpoise.

A thoroughly artistic piece of work is the brochure of 76 pages, entitled "Gillows: A Record of a Furnishing Firm during Two Centuries". It is an entertainingly written history of a celebrated English firm of furniture designers and manufacturers, and contains numerous illustrations of their skilful work. The business was founded in Lancaster about 1695, by Robt. Gillow, a joiner, and has attained large proportions and a world-wide reputation. The factories of the firm are still at Lancaster, with show rooms in Oxford street, London. The latter were established about 1740 in what was then almost in the country. The record of this firm is unique. It embraces an important period in English history and the most important developments in furniture design.



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VICTORIA BUILDERS' EXCHANGE.

On Thursday, April 23rd, the contractors and builders of Victoria, B.C., held a meeting the object being to form a Builders' Exchange. There was a large attendance and it was agreed to organize and form an Exchange to be known as the Victoria Builders' Exchange. The following officers were appointed pro-tem : W. D. McKillican, chairman ; E. W. Whittington, secretary ; Thos. Catterall, treasurer.

NOTES.

Our readers will no doubt be interested in the announcement in this number of the Canada Supply Co. of Windsor, Ont., referring to an entirely new departure in roofing materials in Canada.

A second and enlarged edition of Fred T. Hodgson's book on Estimating Frame and Brick Houses has been published by the David Williams Company, of New York and is sold at $1.00 per copy. The book contains numerous scale drawings and other illustrations.

The Otis Elevator Company, of New York, have announced their intention of putting up a large factory in Canada for the manufacture of Otis elevators. Pending the selection of a suitable location, and the erection of a factory, they have leased the elevator plant of the Leitch & Turnbull Company, Limited, at Hamilton. It is understood that when the new factory is in operation, the Leitch & Turnbull Company will act as Western selling agents for the Otis Company.

The statue of Liberty Enlightening the World, which stands at the entrance to New York Harbour, was the first work which brought M. Eiffel into notice. When several admirers of America in France resolved to present it with a colossal statue that would be symbolic, M. Bartholdi, the sculptor, was invited to prepare the model. After many consultations it was determined that the figure should consist of a number of plates of copper, which were to be riveted together so as to form an exterior covering for a skeleton consisting of lattice girders. The designing of the interior structure was left to M. Eiffel, and his success led to his connection with the Eiffel Tower and his subsequent prosperity. But for some unknown reason says the Builders' Reporter there was no great welcome for poor Liberty when she crossed the Atlantic. She was treated as it she were a white elephant, and was made a casus belli between various departments. At present we believe the War Department has charge of the gift. Mariners do not care for lights of a novel kind, and the flaming torch of Liberty is said to be of no avail. Orders have therefore been given for the light to be extinguished. The copper needs cleaning, and possibly the air may have injured some of the plates. It will not be complimentary to Frenchmen if their offering, which is the biggest statue in the world, should become a ruin.

EXAMINATION TO QUALIFY FOR ASSOCIATESHIP IN THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The Royal Institute of British Architects desiring to give facilities for those in the Colonies to qualify by examination for associateship in the R. I. B. A., will hold the second examination from July 4th to 10th, 1902, in Montreal. Applications, fees and probationary work must reach London not later than May 5th, 1902. Intending candidates who must be over 25 years of age, can obtain application forms and copies of the previous examinations on application to

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All who are full members of the Province of Quebec Association of Architects and the Ontario Association of Architects by examination are exempt from probationary work.

Since the experiments made in 1878 by Flugge on the quantity of air that passes through the walls of a room and produces what has been called "spontaneous ventilation," it has been believed, says the Revue Scientifique, that for small rooms with reasonably tight walls, the air is renewed in the proportion of 0.077 of the volume per hour and per degree (Centigrade) of difference between the inside and outside temperatures. For instance, for a difference of fourteen degrees C, (25·2 degrees Fahr.) the entire air would be renewed in one hour. Experiments to verify the exactness of these figures have been made by H. Wolpert, who has determined hour by hour the proportion of carbonic acid gas contained in the atmosphere of an empty room, the measured diminution enabling him to show the activity of the air-movement inward. The Bulletin des Ingenieurs Civils gives the following results : For rooms with a capacity of sixty cubic metres (about 2,000 cubic feet), with masonry walls covered with paper, the hourly co-efficient of renewal was 0·025 per degree of di[illegible] of temperature, the actual difference being 12·6 degrees C. (22·7 degrees Fahr.) For rooms with walls covered with oil-paint the co-efficient fell to 0·017, and it rose to 0·053 for ordinary whitewashed walls.

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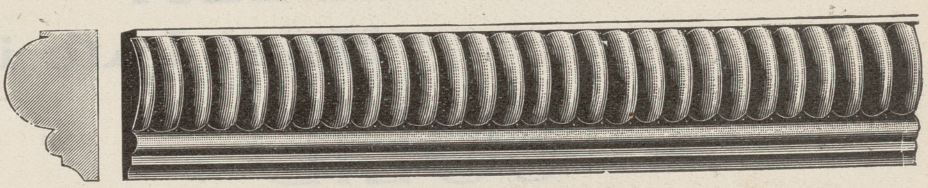

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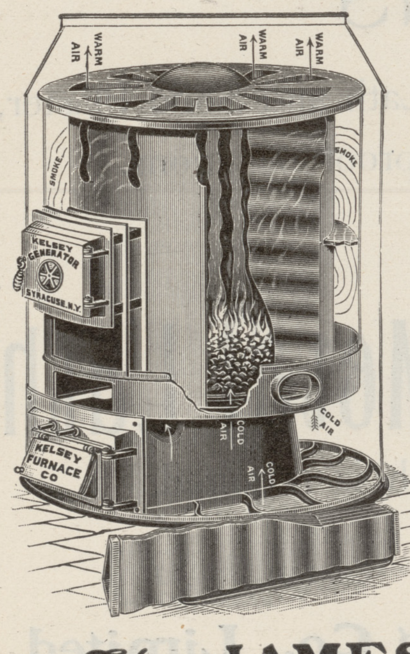

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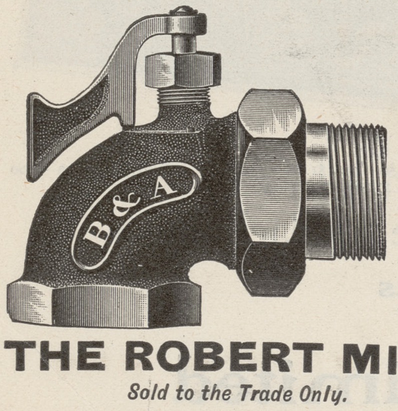

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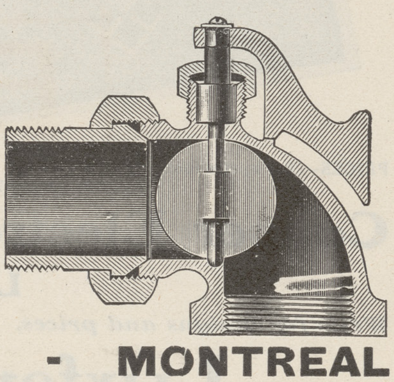

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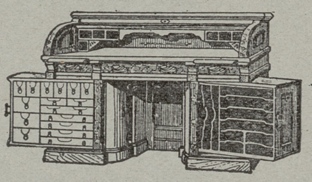

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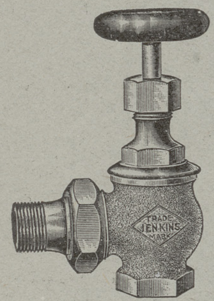

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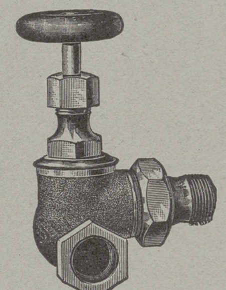

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